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On the Motivations for the Dual-Use of Electronic and Traditional Cigarettes

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Abstract

We apply a classical economic categorization of preferences to identify the motivations of dual-users of electronic and traditional cigarettes. The responses of 2,406 U.S. adults (including 413 dual-users) in 2015 were collected using a novel online survey along with a follow-up in 2016 of 143 of these adults (68 dual-users). A sizeable minority of 37% of dual-users reported viewing electronic and conventional cigarettes primarily as complements. Of those who had never smoked or used electronic cigarettes, only 27% thought the complementarity motive would be primary. Dual-user motivations were associated with quit-attempt, cessation methods, gender and age. One year on, there was a positive relationship between the level of complementarity in the dual-user's motives and their change in self-reported cigarette consumption. It is concluded that the application of a canonical economic classification of preferences may reveal important heterogeneities among the dual-user population.

Keywords: smoking; complements; substitutes; dual-use; preferences

JEL: I12, I18, D12

1. Introduction

In lieu of conclusive long-run studies, surveys and smaller controlled trials have suggested electronic cigarettes (e-cigarettes) containing nicotine can be effective for smoking cessation, and can be more effective than conventional nicotine replacement therapies (Brown et al., 2014; Rahman et al., 2015). However, there is as yet no consensus within the medical community on this point (e.g., Al-Delaimy et al., 2015; Cressey, 2014, 2015). Many policy debates and studies have emphasized this benefit of e-cigarettes (Adriaens et al., 2014; Cahn and Siegel, 2011; Hajek, 2014) though many health professionals and organizations remain uncertain e.g., the World Health Organization (2014) and the American College of Physicians (Crowley, 2015). One area identified by academics (Etter, 2015) and organizations e.g., the Food and Drug Administration (Federal Register, 2014) and Centers for Disease Control and Prevention (Clarke, 2015; Furlow, 2015) as particularly pressing for research is that of dual-use of electronic and traditional cigarettes. To this end, we apply the canonical economic classification of preferences between two goods and ask whether e-cigarettes represent a substitute for or a complement to traditional cigarettes. Notwithstanding other arguments for and against their use, if e-cigarettes were substitutes for all, they would contribute greatly to any associated health and financial benefits of lowering regular cigarette consumption, but if they are complements they may instead blunt regular anti-smoking regulation and potentially prolong or even increase the use of regular cigarettes. Using a novel survey design, we find evidence that while a majority view the products primarily as substitutes, a substantial minority report a primarily complementary motivation.

The economic classification of complements and substitutes can be complex. For instance, the relationship between preferences and prices typically holds one or the other constant, and traditional textbook analysis does not tend to incorporate dynamic considerations (a product

might be a substitute in the short-run but complement in the long-run or vice versa). Furthermore, analyses of aggregate data often implicitly assume consumers' preferences are of some stylized common form and therefore will not be able to identify the potential richness of heterogeneity among individuals in the population. The existence and nature of such heterogeneity is the focus of this article. To this end, we probe the nature of preferences by allowing smokers to self-categorize. Within the confines of this paper a complement (substitute) is defined as in Berry et al (2014): if A is a complement (substitute) for B then the value of product A increases (decreases) with the availability of product B. This definition is in turn based on Milgrom and Roberts (1990) who define complementarity as a positive cross-partial derivative of the utility function with respect to quantities and is also close to the definition in Brandenburger and Nalebuff (2011) who define complementarity as equivalent to super-additivity of the utility function. This is a definition of complementarity which is especially well-suited to an investigation of dynamic complementarity and to any investigation which includes direct evidence of demand, without any need for price data.¹

We emphasize that because we present survey data, our findings are indicative rather than causal. Specifically, although the results can be interpreted from the classical economic viewpoint that preferences are a fundamental which determines behavior, it is also possible either that stated preferences have been shaped by the respondent's experience or that there is another fundamental driving behavior. Also, while we focus on stated consumer preferences, there are many factors that likely determine behavior e.g., prices, regulation etc. This said, the correlations reported in this paper do appear to reveal an important heterogeneity amongst dual-users using a canonical economic notion. In doing so, this paper contributes to the literature in

¹ Discussion of the literature which investigates preferences using price data, can be found in the Supplementary Material.

economics, but is also a contribution from economics to the literatures in medicine and public policy.

2. Materials and Methods

2.1 Data

We designed a survey which ran from March-April 2015 (2,406 U.S. adults responded, including 413 dual-users) and a follow-up survey a year later (143 of the original sample responded, including 68 dual-users). Our participants were recruited through the online platform Amazon Mechanical Turk (Mturk). Online participant pools are not typically representative of the total population and the Mturk pool is, for example, more educated and less employed than the general population (Paolacci and Chandler, 2014). However, Amazon's platform allows data from a diverse participant pool to be collected at relatively little cost and as such has become a popular research tool for social science e.g., Kuziemko et al. (2015).² Furthermore, our purpose is to detect a difference in motivations for dual-use rather than to estimate the corresponding proportions or demographics in the population.

2.2 Measure

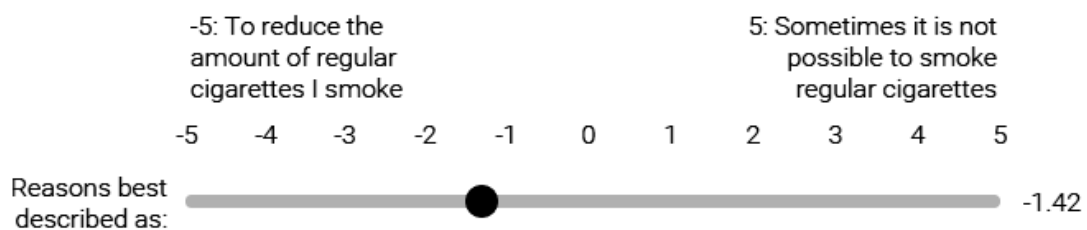
To assess whether dual-users view electronic and traditional cigarettes as substitutes or complements, respondents who had reported ever-use of e-cigarettes were asked the following 'substitute-complement' question: *Please indicate which point on the following scale best describes the reasons you use (or used/tried) electronic cigarettes* followed by a slider on a ten-point scale -5 to 5, recording responses to two decimal places. There were two labels: one above -5 which read *To reduce the amount of regular cigarettes I smoke* and one above 5 which

² Discussion of the extant medical survey literature; the Mturk platform and participant pool; and details of the survey we ran on it can be found in the Supplementary Material.

read *Sometimes it is not possible to smoke regular cigarettes*. A screenshot with an example response is provided in Fig. 1. The final screen presented basic demographic questions including gender, age and income.³

Fig. 1: Screenshot of the ‘Substitute-Complement’ Question, Measuring the Motivation for Dual-Use.

Please indicate which point on the following scale best describes the reasons you use (or used/tried) electronic cigarettes:



Notes: This question was asked to those who reported ever having used an e-cigarette. As an example, this shot shows a participant selecting -1.42.

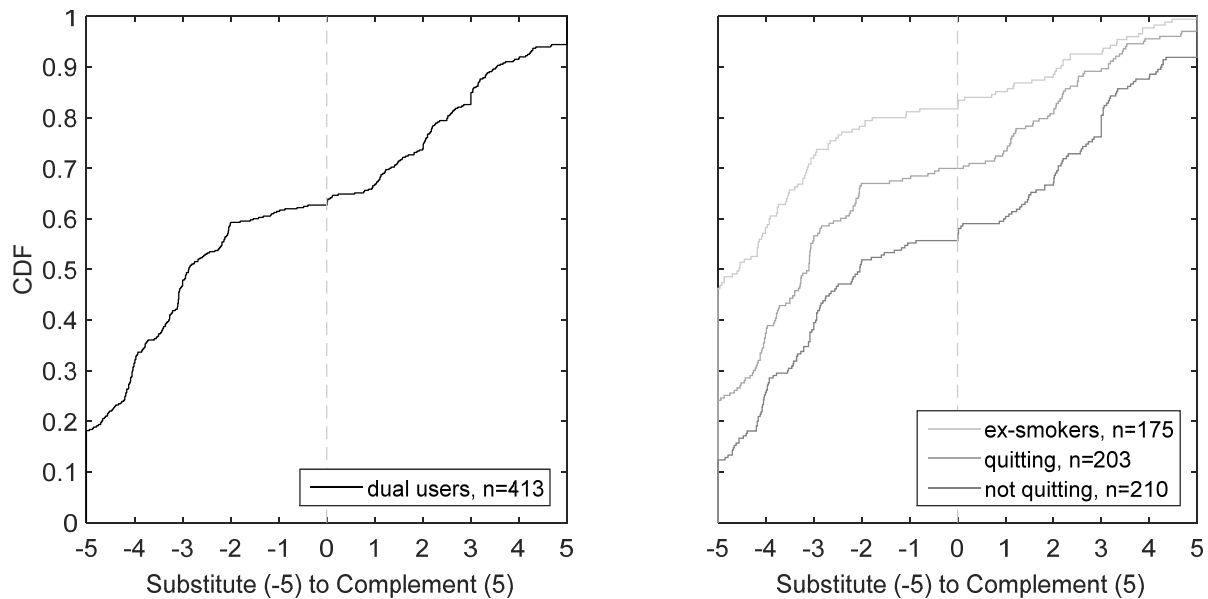
3. Results

Fig. 2A displays the empirical cumulative distribution of responses of dual-users to the substitute-complement question shown in Fig. 1. The data reveals that there is a high degree of variation in how users view these products. Panel A shows that 37% selected a point greater than 0, indicating that they primarily use e-cigarettes as a complementary product. Moreover, 6% felt they were best described by the point furthest to the right, 5, suggesting that for these smokers, e-cigarettes are strong complements with any substitutive motive dominated. A majority of 63% of dual-users reported that they were best described by a point less than 0,

³ More detail, including a breakdown of respondent demographics and the transcripts of the surveys can be found in the Supplementary Material.

indicating that they primarily use e-cigarettes to substitute away from traditional cigarettes. Moreover, 18% felt they were best described by the point furthest to the left, -5, suggesting that for these smokers, e-cigarettes are strong substitutes.

Fig. 2: Empirical CDF of Responses to the ‘Substitute–Complement’ Question.



Notes: Breakdown of responses by quit status. A. The response of dual-users. B. ‘ex-smokers’: past smokers and current or past e-cigarette users; ‘quitting’ and ‘not quitting’: dual-users who respectively are and are not *currently trying to quit smoking cigarettes*.

Fig. 2B shows there is a strong relationship between quit-status and why smokers use e-cigarettes. Past smokers who reported currently using e-cigarettes every day or some days (labelled ‘ex-smokers’) are the most likely to have used e-cigarettes primarily as substitutes (80%), followed by dual-users who are trying to quit (70%), and finally by those with no intention of quitting (56%). The distributions of responses are ordered by first-order stochastic dominance, displaying a clear ordering from left to right by quit-status. These differences are

statistically significant (Kolmogorov-Smirnov two-sample tests: $P < 0.01$ for ex-smokers vs. quitting; $P=0.003$ for quitting vs. not-quitting).

Table 1 displays logistic regression results on the differences in the characteristics of dual-users who use e-cigarettes as a complement rather than a substitute. Confirming the results of Fig. 2B, those reporting trying to quit were more likely to be those using e-cigarettes as a substitute ($OR = 0.42$, 95% $CI = [0.27, 0.66]$, $P < 0.001$). It was also found that if a smoker using e-cigarettes was using another cessation method or product, it is much more likely that they used e-cigarettes as a complementary product ($OR = 2.74$, 95% $CI = [1.58, 4.75]$, $P < 0.001$). Regarding levels of consumption, there was borderline evidence that those reporting higher e-cigarette usage are more likely to be using them as a substitute ($OR = 0.97$, 95% $CI = [0.95, 1.00]$, $P = 0.05$), whereas there was no difference in the quantity of cigarettes smoked.

Being male was strongly associated with being a complementary user ($OR = 6.51$, 95% $CI = [1.65, 25.72]$, $P = 0.007$). There was no overall difference across ages, but there was an age effect by gender: among younger respondents, males (females) are relatively more likely to use e-cigarettes as a complement (substitute). Further, the coefficient of age squared was statistically significant at the 10% level ($OR=1.0031$, 95% $CI = [0.9996, 1.0066]$, $P = 0.09$), suggesting that this age effect by gender falls relatively quickly with age. There was no relationship found between income and the motivation for e-cigarette usage.

Table 1: Characteristics of Complementary and Substitutive Dual-users.

Variable	Odd-ratio (95% CI)
Quitting ^a	0.42*** (0.27, 0.66)
Other method(s) ^b	2.74*** (1.58, 4.75)
E-cigarette consumption ^c	0.97* (0.95, 1.00)
Cigarette consumption ^d	1.00 (0.98, 1.03)
Gender ^e	6.51*** (1.65, 25.73)
Age ^f	1.10 (0.98, 1.23)
Age ²	0.998 (0.995, 1.0004)
Gender × Age	0.85** (0.73, 0.99)
Gender × Age ²	1.0031* (0.9996, 1.0066)
Income ^g	1.01 (0.93, 1.10)
Constant	0.29 (0.09, 0.97)
Dependent variable	= 0 Substitute, = 1 Complement
Reference category	Substitute
Observations	413
Pseudo R ²	0.09

Notes. Logistic regression. Stars denote coefficients being significantly different from one at the 1% (***), 5% (**) or 10% (*) level. Robust standard errors were used. ^a *Would you describe yourself as someone who is currently trying to quit smoking cigarettes?* No = 0, Yes = 1. ^b *Have you used any of the following smoking-cessation services or products?* None selected = 0, At least one selected = 1. ^c *About how many times do you use e-cigarettes in a typical day?* ^d *About how many cigarettes do you smoke in a typical day?* ^e Female = 0, Male = 1. ^f Age was rescaled to start from zero by subtracting 18. ^g Ten ascending income bands.

Table 2: The Perception Gap.

	Substitute % (N)	Complement % (N)
Non-smoker, never e-cigarette users	72.95 (623)	27.05 (231)
Dual-users	62.71 (259)	37.29 (154)

Note: Percentages are reported here for ease of comparison where each rows sums to 100%.

Those who had never used e-cigarettes were presented with the question shown in Fig. 1 but with the wording changed such that the question was about their thoughts on dual-users' motivations. Table 2 compares dual-users' actual motivation to the perception of that motivation by respondents with the least exposure to smoking and e-cigarettes. There were 854 non-smokers who are e-cigarette never users, and 413 dual-users. Although 37% of dual-users reported using e-cigarettes primarily as complements to conventional cigarettes, only 27% of non-smokers who had never tried an e-cigarette thought the complementarity motive would be stronger. This difference was statistically significant ($\chi^2(1) = 13.80$, $P < 0.001$). This suggests that those outside the smoking and vaping population do not have accurate perceptions about the motivations for dual-use.

The analysis of the motivation for dual-use and the change in self-reported cigarette consumption is presented in Table 3. There were 68 dual-users who responded to the follow-up survey, one year after the main survey. There was a positive association between the change in reported smoking and the strength of the complementary motive for using e-cigarettes. Interpreting the estimation, the model predicts that the average individual responding -5 (strong substitution motive) decreased cigarette consumption by approximately 12 cigarettes per week

year-on-year whereas an individual responding 5 (strong complementary motive) *increased* consumption by approximately 30 cigarettes.

Table 3: Dual-Users' Cigarette Consumption and Motivations.

Variable	Coefficient Estimate (95% CI)
Response on the substitute-complement scale	4.18** (0.17, 8.20)
Constant	9.19 (-5.07, 23.45)
Dependent Variable: Reported weekly cigarette consumption in 2016 minus response to same question one year earlier.	
Observations	68
R ²	0.06

Note: ** Denotes coefficients being significantly different from zero at the 5% level.

4. Conclusion

The results presented here contribute to the literature by identifying two distinct groups of dual-users of electronic and traditional cigarettes by leaning on the classical economic conceptualization of the relationship between two goods as substitutes or complements. We encourage future studies to further investigate this classification of types of dual-user and for policy-makers to consider that regulations may have very different effects on different types of dual-users.

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On the Motivations for the Dual-Use of Electronic and Traditional Cigarettes:
Supplementary Materials

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Note: this document includes the supplementary materials referenced within the main paper “On the Motivations for the Dual-Use of Electronic and Traditional Cigarettes” by Ronayne & Sgroi.

Contents:

Survey Motivation and Literature	2
Amazon Mechanical Turk.....	2
Sample Demographics	3
Table A1: Demographics	4
References.....	7
Survey Transcripts Method.....	9
Transcript of Initial Survey	9
Transcript of Follow-Up Survey	17

Surveys in the Literature

This study presents a novel survey methodology. Other surveys have asked dual e-cigarette and cigarette users their motivation for using e-cigarettes, typically presenting a list of reasons and allowing the respondent to answer each one *Yes* or *No* (Adkison et al., 2013; Brown et al., 2014; Dockrell et al., 2013; Etter and Eissenberg, 2015; Goniewicz et al., 2013; Li et al., 2015; Tackett et al., 2015; Zhu et al., 2013). This makes it difficult to ascertain the relative importance of the reasons for e-cigarette use, something better served by requiring respondents to consider a trade-off between their reasons for using e-cigarettes. Some studies have asked respondents to select the primary reason they started using e-cigarettes (Goniewicz et al., 2013; Tackett et al., 2015; Rass et al., 2015). One study compiled all of their participants' statements regarding their reasons for use, resulting in a list of 125 inter-related statements (Soule et al., 2016). The present study is the first to our knowledge to pose the question regarding the reason for e-cigarette use as a direct trade-off between two fundamental economic classifications of preferences, to provide information on the strength of this trade-off, and to analyze how this measure is related to demographics and the related change over time in self-reported cigarette consumption.

The Amazon Mechanical Turk Platform

We designed a survey to be run on the online platform Amazon Mechanical Turk (Mturk). Amazon's platform allows data from a diverse participant pool to be collected at relatively little cost and as such has become a popular research tool for social science (Kuziemko et al., 2015; Paolacci and Chandler, 2014). Compared to the general population, participants recruited through the Mturk platform tend to be younger, better educated and more likely to be female (Berinsky et al., 2012; Ipeirotis, 2010; Paolacci and Chandler, 2014; Paolacci et al., 2010). The quality of responses has been found to be as reliable as that found in controlled laboratory environments across a variety of domains (Berinsky et al., 2012; Horton et al., 2012). Workers on Amazon's platform can be blocked for poor quality work and so have an incentive to maintain the quality of their responses. Participants for the present study were required to have an Mturk approval rating of at least 95% and to be resident in the U.S. We are aware of one existing study on e-cigarettes which utilized the Mturk participant pool (Rass et al., 2015). The present study however is the first using the platform not to place any restrictions for participation by smoking habit, and to follow respondents through time.

Our initial survey was active on Mturk from 23 March 2015 to 10 April 2015. A total of 2,492 participants responded. Participants were compensated with \$0.50. Average completion time was 4 minutes 26 seconds, corresponding to a wage of \$6.76 per hour. There were 86 participants who failed to complete the survey and 36 who had not heard of e-cigarettes. These participants' data were removed, leaving 2,370 for analysis.

The follow up survey was posted a year later from 23 March 2016 to 19 April 2016. Only those from the main survey who reported having smoked more than 100 cigarettes or had used e-cigarettes (or both) were invited to take the follow up survey. Workers on the Mturk platform may work as much or as little as they like. They may also leave or join the participant pool

freely and it has been estimated that the time required for half the platform's workers to leave and be replaced is about seven months (Stewart et al, 2015). With a one-year gap between surveys, high attrition rates are possible. Despite this, we wanted to leave a sufficiently long time in order to pick up any changes in the long-run behavior of respondents. In an effort to boost response rates participants were compensated with \$0.75. A total of 143 responded, of which 68 had been classified as dual-users in the first survey. Average completion time was 4 minutes 41 seconds, corresponding to an implied wage of \$9.62 per hour.

Sample Demographics

Table A1 shows basic descriptive statistics of those responding to the initial survey. The age and income of the participants are in line with these existing studies using Mturk. There was however a higher proportion of males (55%) which is likely explained by the higher prevalence of smoking among men since the survey was specifically advertised as being of relevance for smokers who are more likely to be male: 16.7% vs. 13.6% among women (Jamal et al., 2016). The only notable difference between the main sample and the dual-user subsamples was the higher proportion of males (61.5% in the initial survey, 64.7% in the follow-up). However, this too is naturally explained by the population estimate from Syamlal et al. (2016) that approximately 63% of those using e-cigarettes are male. Respondents also reported rates of dual-use, current smoking and past smoking higher than is likely to be nationally representative. There was also a very high awareness of e-cigarettes (99%). These findings are likely due to the bias generated by respondents opting to take the survey which was advertised with the title: *Tell us whether you smoke or not, and your opinions about smoking and electronic cigarettes*. However, this over-representation of those who use or used electronic and traditional cigarettes is not considered problematic because the purpose of the study was to study the motivations, perceptions and behaviors of and between these groups, not to estimate the proportions of these groups in the U.S. population.

Table A1: Summary Statistics of Respondents.

Characteristic	Survey1: total		Survey1: dual-users		Survey 2: dual-users	
	N	%	N	%	N	%
Sample Size	2,370		413		68	
Usage						
Current smoker	800	33.8				
<i>By e-cigarette usage:</i>						
Current (dual-user)	413	17.4				
Past	166	7.0				
One-time	90	3.8				
Never	131	5.5				
Past smoker	513	21.6				
<i>By e-cigarette usage:</i>						
Current	97	4.1				
Past	78	3.3				
One-time	69	2.9				
Never	269	11.4				
Non-smoker	1,057	44.6				
<i>By e-cigarette usage:</i>						
Current	43	1.8				
Past	40	1.7				
One-time	120	5.1				
Never	854	36.0				
Gender						
Male	1,294	55.6	254	61.5	44	64.7
Female	1,076	45.4	159	38.5	24	35.3
Age						
18-25	537	22.7	94	22.8	11	16.2
26-30	580	24.5	112	27.1	19	27.9
31-40	659	27.8	118	28.6	21	30.9
41-50	313	13.2	60	14.5	9	13.2
51+	281	11.9	29	7.0	8	11.8
Annual Household Income ('000 USD)						
0 - 9.999	169	7.1	24	5.8	4	5.9
10 - 19.999	267	11.3	55	13.3	10	14.7
20 - 29.999	346	14.6	61	14.8	10	14.7
30 - 39.999	360	15.2	70	17.0	13	19.1
40 - 49.999	264	11.1	48	11.6	7	10.3
50 - 59.999	257	10.8	49	11.9	8	11.8
60 - 69.999	177	7.5	32	7.8	9	13.2
70 - 79.999	150	6.3	22	5.3	3	4.4
80 - 99.999	169	7.1	23	5.6	2	2.9
≥ 100	211	8.9	29	7.0	2	2.9

Table A1 Legend. Current smokers: >100 cigarettes in their life and currently smoking. Current e-cigarette use: now use e-cigarettes *Every day* or *Some days*. Past e-cigarette use: now use e-cigarettes *Not at all* but in the past, *Every day* or *Some days*. Age statistics are reported with one year added for statistics regarding survey 2 e.g., “19-26” is the first category.

Measures

All respondents were asked *Have you smoked at least 100 cigarettes in your entire life?* and *Do you now smoke cigarettes at all, no matter how regularly?* Those reporting having smoked at least 100 cigarettes and now smoking were defined as ‘current smokers’. Those reporting having smoked 100 cigarettes and now not smoking are defined as ‘past smokers’. Those who reported having smoked less than 100 cigarettes were defined as ‘non-smokers’. Regarding e-cigarette ever-use, all respondents were asked *Have you tried Electronic Cigarettes or "E-cigarettes", even just one time?* Those who answered *Yes* were classified as e-cigarette ever-users and were also asked *Do you now use e-cigarettes every day, some days, or not at all?* Current smokers who reported having tried e-cigarettes and using them *Every day* or *Some days*, were classified as ‘dual-users’.

To assess whether dual-users view electronic and traditional cigarettes as substitutes or complements, respondents who had reported ever-use of e-cigarettes were asked the following ‘substitute-complement’ question: *Please indicate which point on the following scale best describes the reasons you use (or used/tried) electronic cigarettes* followed by a slider on a ten-point scale -5 to 5, recording responses to two decimal places. There were two labels: one above -5 which read *To reduce the amount of regular cigarettes I smoke* and one above 5 which read *Sometimes it is not possible to smoke regular cigarettes*. A screenshot with an example response is provided in Fig. 1. The cursor was centered at 0 when the page loaded and participants had to actively select a value before they could continue. There was no time limit for the question and participants could not go back to change their response once they had confirmed it. Those who had never used e-cigarettes were presented with the same question except the wording was changed to *Please indicate which point on the following scale best describes what you think the reasons are that people use electronic cigarettes* and the label over the extreme value of -5 was replaced with *To reduce the amount of regular cigarettes they smoke*.

There were 68 dual-users who responded to the follow-up survey. Analysis of these participants’ data is reported in Table 3 of the main text. Respondents who reported they smoke *Some days* were asked *About how many cigarettes do you smoke in a typical week?* whereas those reportedly smoking *Every day* were asked *About how many cigarettes do you smoke in a typical day?* The data from these respondents was converted into weekly consumption data by multiplying by seven. There were 49 who reported substitutive use, of which 65% reported the same or lower cigarette consumption than a year previous. However, of the 19 that reported complementary use, 58% reported a higher level of consumption than the year before.

Substitutes and Complements

A typical undergraduate textbook would tend to focus on a simpler definition of a complement (substitute) as a negative (positive) cross-price elasticity of demand which tends to be associated with static single-agent problems and is also a less versatile definition as it requires data on prices: see Berry et al (2014) for more on the pros and cons of different definitions. It is worth noting here that there do exist demand analyses of electronic and traditional cigarettes.

For example, Huang et al. (2014) find that the demand for e-cigarettes are more sensitive to price changes as compared to traditional cigarettes, with own price elasticities in the range -1.2 to -1.9 (for disposable and reusable e-cigarettes respectively) as compared with estimates of -0.2 to -0.6 for traditional cigarettes. This means that price changes would be likely to have a significant impact on e-cigarette usage. In this context, the present article facilitates an understanding of the differential impact this could in turn have on traditional cigarette consumption for different types of dual-users.

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Survey Transcripts Method

The survey was conducted using the online survey software Qualtrics. The question numbers displayed here, along with the coded values shown in parentheses correspond to the coding of the data as it is displayed in the results file available online. The questions were organized in blocks. Which blocks participants saw depended on their prior answers. We indicate any criteria to see a block. Within blocks, some questions were also restricted to be shown only to participants giving particular prior answers. Where there are such conditions, they are shaded blue.

Initial Survey Transcript

Block 1: All

Q23 In order to participate in this research study, it is necessary that you give your informed consent. By responding you are indicating that you understand the nature of the research study and your role and that you agree to participate in the research. Please consider the following points before continuing: I understand that I am participating in research conducted by the University of Warwick. I understand the research team will use anonymized data in any presentations of the research results. Data will not be associated with individuals and any identifying data will then be destroyed. I understand that my participation in this study is voluntary, and that after the study data collection has begun, I may refuse to participate further without any penalty. By continuing I am stating that I am over 18 years of age, and that I have read the above information and consent to participate in this study being conducted. Please click "I agree" to agree that you have read and understood the information above:

- ☐ I agree (1)

Block 2: All

Q24 Have you smoked at least 100 cigarettes in your entire life?

- ☐ Yes (1)
- ☐ No (2)

Q32 Do you now smoke cigarettes at all, no matter how regularly?

- ☐ Yes (1)
- ☐ No (2)

Block 3: If Q32 = Yes

Q25 Do you now smoke cigarettes every day or some days?

- ☐ Every day (1)
- ☐ Some days (2)

If Q25 = Every day:

Q27 About how many cigarettes do you smoke in a typical day?

If Q25 = Some days:

Q28 About how many cigarettes do you smoke in a typical week?

Block 4: If Q24=Yes and Q32=No

Q31 About how long has it been since you last smoked cigarettes?

- ☐ 0-3 months (1)
- ☐ 3-6 months (2)
- ☐ 6-12 months (3)
- ☐ 1-2 years (4)
- ☐ 2-3 years (5)
- ☐ 3-4 years (6)
- ☐ 4-5 years (7)

Q55 During the last period you smoked, did you smoke cigarettes every day or some days?

- ☐ Every day (1)
- ☐ Some days (2)

If Q55 = Every day

Q56 During this period, about how many cigarettes did you smoke in a typical day?

If Q55 = Some days Is Selected

Q57 During this period, about how many cigarettes do you smoke in a typical week?

Block 5: All

Q29 Have you tried Electronic Cigarettes or "E-cigarettes", even just one time?

- ☐ Yes (1)
- ☐ No (2)

If Q29 = No

Q40 Have you ever heard of Electronic Cigarettes or "E-cigarettes"?

- ☐ Yes (4)
- ☐ No (5)

Block 6: If Q29=Yes

Q30 Do you now use e-cigarettes every day, some days, or not at all?

- ☐ Every day (1)
- ☐ Some days (2)
- ☐ Not at all (3)

If Q30 = Every day

Q31 About how many times do you use e-cigarettes in a typical day?

If Q30 = Some days

Q32 About how many times do you use e-cigarettes in a typical week?

Block 7: If Q30=Not at all

Q33 About how long has it been since you last used e-cigarettes?

- ☐ 0-3 months (2)
- ☐ 3-6 months (3)
- ☐ 6-12 months (4)
- ☐ 1-2 years (5)
- ☐ 2-3 years (6)
- ☐ 3-4 years (7)
- ☐ 4-5 years (9)
- ☐ 5+ years (10)

Q65 During the last period you used e-cigarettes, did you use them every day, some days or just one time?

- ☐ Every day (1)
- ☐ Some days (2)
- ☐ Just one time (3)

If Q65 = Every day

Q66 During this period, about how many times do you use e-cigarettes in a typical day?

If Q65 = Some days

Q67 During this period, about how many times do you use e-cigarettes in a typical week?

Block 8: If Q29=Yes or Q40=Yes

Q41 No matter what your smoking history is, we are interested in your opinions.

Q11 Below are some of the advantages that people often think electronic cigarettes have over conventional cigarettes. Please give us your opinion of the order of importance of these advantages by ranking them from 1 (most important) to 6 (least important).

- _____ Lower health risks (9)
- _____ No second hand smoke (10)
- _____ Cheaper (11)
- _____ Can use them in many public places (14)
- _____ Less odor (12)
- _____ Less risk of causing a fire (13)

Q12 Below are some of the disadvantages that people often think electronic cigarettes have over conventional cigarettes. Please give us your opinion of the order of importance of these disadvantages by ranking them from 1 (most important) to 6 (least important).

- _____ Not the same experience as cigarettes (3)
- _____ Unsure about health risks (2)
- _____ Cost of equipment (1)
- _____ Too addictive (4)
- _____ Concern over product malfunction (5)
- _____ Confusing number of brands and products (6)

If Q29 = Yes

Q23 Please indicate which point on the following scale best describes the reasons you use (or used/tried) electronic cigarettes:

Reasons best described as: [-5,5] sliding scale to two decimal places as shown in Fig. 1. Label over -5 read “To reduce the amount of regular cigarettes I smoke”, label over 5 read “Sometimes it is not possible to smoke regular cigarettes”.

If Q29 = No

Q25 Please indicate which point on the following scale best describes what you think the reasons are that people use electronic cigarettes:

Reasons best described as: [-5,5] sliding scale to two decimal places. Label over -5 read “To reduce the amount of regular cigarettes they smoke”, label over 5 read “Sometimes it is not possible to smoke regular cigarettes”.

Q30 Considering the arguments for and against e-cigarettes, and that they may affect different people in different ways: Please use the slider below to indicate your opinion on how they will affect society on average?

My opinion is best described as: [-5,5] sliding scale to two decimal places. Label over -5 read “negative effect”, label over 0 read “no net effect”, label over 5 read “positive effect”.

Q31 If you would like to, please explain how you think e-cigarettes will impact society. (optional)

Block 9: Q32=Yes

Q32 Have you used any of the following smoking-cessation services or products? (select all that apply, if any)

	Smoking Cessation Methods	
	Currently (1)	In the past (2)
Doctor consultation (9)	<input type="checkbox"/>	<input type="checkbox"/>
Counseling (10)	<input type="checkbox"/>	<input type="checkbox"/>
Behavioral Therapy (11)	<input type="checkbox"/>	<input type="checkbox"/>
Other non-medical method (12)	<input type="checkbox"/>	<input type="checkbox"/>
Gum (2)	<input type="checkbox"/>	<input type="checkbox"/>
Patches (4)	<input type="checkbox"/>	<input type="checkbox"/>
Nasal Spray (5)	<input type="checkbox"/>	<input type="checkbox"/>
Inhalers (6)	<input type="checkbox"/>	<input type="checkbox"/>
Lozenges (7)	<input type="checkbox"/>	<input type="checkbox"/>
Other medication (8)	<input type="checkbox"/>	<input type="checkbox"/>

Q26 Would you describe yourself as someone who is currently trying to quit smoking cigarettes?

- ☐ Yes (2)
☐ No (3)

Block 10: If Q32=No and Q24=Yes

Q37 Have you used any of the following smoking-cessation services or products? (select all that apply, if any)

	Smoking Cessation Methods	
	I have used the following: (1)	
Doctor consultation (9)	<input type="checkbox"/>	
Counseling (10)	<input type="checkbox"/>	
Behavioral Therapy (11)	<input type="checkbox"/>	
Other non-medical method (12)	<input type="checkbox"/>	
Gum (2)	<input type="checkbox"/>	
Patches (4)	<input type="checkbox"/>	
Nasal Spray (5)	<input type="checkbox"/>	
Inhalers (6)	<input type="checkbox"/>	
Lozenges (7)	<input type="checkbox"/>	
Other medication (8)	<input type="checkbox"/>	

If Q29 = Yes and if Q37 has at least one item checked:

Q38 When you compare e-cigarettes to any other cessation methods you used, which was more effective for you?

Most effective for me: [-5,5] sliding scale to two decimal places. Label over -5 read “other methods”, label over 5 read “e-cigarettes”.

Block 11: All

Q43 Do you avoid certain unhealthy food or drink?

- ☐ Yes (1)
- ☐ No (2)

Q27 Are you currently a member of a health club or fitness center?

- ☐ Yes (1)
- ☐ No (2)

Q28 Do you pay into Medicare?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Q29 Do you pay into a private health insurance plan?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't Know (3)

Q15 Are you male or female?

- ☐ Male (1)
- ☐ Female (2)

Q16 How old are you?

Q31 Which state do you primarily live in?

- ☐ Alabama (1)
- ☐ Alaska (2)
- ☐ Arizona (3)
- ☐ Arkansas (4)
- ☐ California (5)
- ☐ Colorado (6)
- ☐ Connecticut (7)
- ☐ Delaware (8)
- ☐ District of Columbia (9)
- ☐ Florida (10)
- ☐ Georgia (11)
- ☐ Hawaii (12)
- ☐ Idaho (13)
- ☐ Illinois (14)
- ☐ Indiana (15)
- ☐ Iowa (16)
- ☐ Kansas (17)
- ☐ Kentucky (18)
- ☐ Louisiana (19)
- ☐ Maine (20)
- ☐ Maryland (21)
- ☐ Massachusetts (22)
- ☐ Michigan (23)
- ☐ Minnesota (24)
- ☐ Mississippi (25)
- ☐ Missouri (26)
- ☐ Montana (27)
- ☐ Nebraska (28)
- ☐ Nevada (29)
- ☐ New Hampshire (30)
- ☐ New Jersey (31)
- ☐ New Mexico (35)
- ☐ New York (32)
- ☐ North Carolina (33)
- ☐ North Dakota (34)
- ☐ Ohio (36)
- ☐ Oklahoma (37)
- ☐ Oregon (38)
- ☐ Pennsylvania (39)
- ☐ Rhode Island (40)
- ☐ South Carolina (41)
- ☐ South Dakota (42)
- ☐ Tennessee (43)
- ☐ Texas (44)
- ☐ Utah (45)
- ☐ Vermont (46)
- ☐ Virginia (47)
- ☐ Washington (48)
- ☐ West Virginia (49)
- ☐ Wisconsin (50)
- ☐ Wyoming (51)

Q17 Please indicate your household's annual pre-tax income. (US \$)

- ☐ 0 - 9,999 (1)
- ☐ 10,000 - 19,999 (2)
- ☐ 20,000 - 29,999 (3)
- ☐ 30,000 - 39,999 (4)
- ☐ 40,000 - 49,999 (5)
- ☐ 50,000 - 59,999 (6)
- ☐ 60,000 - 69,999 (7)
- ☐ 70,000 - 79,999 (8)
- ☐ 80,000 - 99,999 (10)
- ☐ 100,000 or more (9)

Follow-Up Survey Transcript

Block 1: All

Q23 In order to participate in this research study, it is necessary that you give your informed consent. By responding you are indicating that you understand the nature of the research study and your role and that you agree to participate in the research. Please consider the following points before continuing: I understand that I am participating in research conducted by the University of Warwick. I understand the research team will use anonymized data in any presentations of the research results. Data will not be associated with individuals and any identifying data will then be destroyed. I understand that my participation in this study is voluntary, and that after the study data collection has begun, I may refuse to participate further without any penalty. By continuing I am stating that I am over 18 years of age, and that I have read the above information and consent to participate in this study being conducted. Please click "I agree", to agree that you have read and understood the information above:

- ☐ I agree (1)

Block 2: All

Q32 Do you now smoke cigarettes at all, no matter how regularly?

- ☐ Yes (1)
- ☐ No (2)

Block 3: If Q32=Yes

Q25 Do you now smoke cigarettes every day or some days?

- ☐ Every day (1)
- ☐ Some days (2)

Answer If Q25 = Every day:

Q27 About how many cigarettes do you smoke in a typical day?

Answer If Q25 = Some days:

Q28 About how many cigarettes do you smoke in a typical week?

Block 4: If Q32=No

Q31 About how long has it been since you last smoked cigarettes?

- ☐ 0-3 months (1)
- ☐ 3-6 months (2)
- ☐ 6-12 months (3)
- ☐ 1-2 years (4)
- ☐ 2-3 years (5)
- ☐ 3-4 years (6)
- ☐ 4-5 years (7)
- ☐ 5+ years (8)

Q55 During the last period you smoked, did you smoke cigarettes every day or some days?

- ☐ Every day (1)
- ☐ Some days (2)

Answer if Q55 = Every day:

Q56 During this period, about how many cigarettes did you smoke in a typical day?

Answer if Q55 = Some days:

Q57 During this period, about how many cigarettes did you smoke in a typical week?

Block 5: All

Q30 Do you now use e-cigarettes every day, some days, or not at all?

- ☐ Every day (1)
- ☐ Some days (2)
- ☐ Not at all (3)

Answer if Q30 = Every day:

Q31 About how many times do you use e-cigarettes in a typical day?

Answer if Q30 = Some days:

Q32 About how many times do you use e-cigarettes in a typical week?

Block 6: If Q30 = Not at all:

Q33 About how long has it been since you last used e-cigarettes?

- ☐ 0-3 months (2) _____
- ☐ 3-6 months (3) _____
- ☐ 6-12 months (4) _____
- ☐ 1-2 years (5)
- ☐ 2-3 years (6)
- ☐ 3-4 years (7)
- ☐ 4-5 years (9)
- ☐ 5+ years (10)

Q65 During the last period you used e-cigarettes, did you use them every day, some days or just one time?

- ☐ Every day (1)
- ☐ Some days (2)
- ☐ Just one time (3)

Answer if Q65 = Every day:

Q66 During this period, about how many times did you use e-cigarettes in a typical day?

Answer if Q65 = Some days:

Q67 During this period, about how many times did you use e-cigarettes in a typical week?

Block 7: All

Q41 No matter what your smoking history is, we are interested in your opinions.

Q11 Below are some of the advantages that people often think electronic cigarettes have over conventional cigarettes. Please give us your opinion of the order of importance of these advantages by ranking them from 1 (most important) to 6 (least important).

- _____ Lower health risks (9)
- _____ No second hand smoke (10)
- _____ Cheaper (11)
- _____ Can use them in many public places (14)
- _____ Less odor (12)
- _____ Less risk of causing a fire (13)

Q12 Below are some of the disadvantages that people often think electronic cigarettes have over conventional cigarettes. Please give us your opinion of the order of importance of these disadvantages by ranking them from 1 (most important) to 6 (least important).

- _____ Not the same experience as cigarettes (3)
- _____ Unsure about health risks (2)
- _____ Cost of equipment (1)
- _____ Too addictive (4)
- _____ Concern over product malfunction (5)
- _____ Confusing number of brands and products (6)

Block 8: All

Q23 Please indicate which point on the following scale best describes the reasons you use (or used/tried) electronic cigarettes:

Reasons best described as: [-5,5] sliding scale to two decimal places as shown in Fig. 1. Label over -5 read “To reduce the amount of regular cigarettes I smoke”, label over 5 read “Sometimes it is not possible to smoke regular cigarettes”.

Block 9: All

Q30 Considering the arguments for and against e-cigarettes, and that they may affect different people in different ways: Please use the slider below to indicate your opinion on how they will affect society on average?

My opinion is best described as: [-5,5] sliding scale to two decimal places. Label over -5 read “negative effect”, label over 0 read “no net effect”, label over 5 read “positive effect”.

Q31 If you would like to, please explain how you think e-cigarettes will impact society. (optional)

Block 10: If Q32 = Yes

Q32 Have you used any of the following smoking-cessation services or products? (select all that apply, if any)

	Smoking Cessation Methods	
	Currently (1)	In the past (2)
Doctor consultation (9)	<input type="checkbox"/>	<input type="checkbox"/>
Counseling (10)	<input type="checkbox"/>	<input type="checkbox"/>
Behavioral Therapy (11)	<input type="checkbox"/>	<input type="checkbox"/>
Other non-medical method (12)	<input type="checkbox"/>	<input type="checkbox"/>
Gum (2)	<input type="checkbox"/>	<input type="checkbox"/>
Patches (4)	<input type="checkbox"/>	<input type="checkbox"/>
Nasal Spray (5)	<input type="checkbox"/>	<input type="checkbox"/>
Inhalers (6)	<input type="checkbox"/>	<input type="checkbox"/>
Lozenges (7)	<input type="checkbox"/>	<input type="checkbox"/>
Other medication (8)	<input type="checkbox"/>	<input type="checkbox"/>

Q26 Would you describe yourself as someone who is currently trying to quit smoking cigarettes?

- ☐ Yes (2)
☐ No (3)

Block 11: If Q32 = No

Q37 Have you used any of the following smoking-cessation services or products? (select all that apply, if any)

	Smoking Cessation Methods	
	I have used the following: (1)	
Doctor consultation (9)	<input type="checkbox"/>	
Counseling (10)	<input type="checkbox"/>	
Behavioral Therapy (11)	<input type="checkbox"/>	
Other non-medical method (12)	<input type="checkbox"/>	
Gum (2)	<input type="checkbox"/>	
Patches (4)	<input type="checkbox"/>	
Nasal Spray (5)	<input type="checkbox"/>	
Inhalers (6)	<input type="checkbox"/>	
Lozenges (7)	<input type="checkbox"/>	
Other medication (8)	<input type="checkbox"/>	

Answer if Q37 has at least one item checked:

Q38 When you compare e-cigarettes to any other cessation methods you used, which was more effective for you?

Most effective for me: [-5,5] sliding scale to two decimal places. Label over -5 read “other methods”, label over 5 read “e-cigarettes”.

Block 12: All

Q15 Are you Male or Female?

- ☐ Male (1)
- ☐ Female (2)

Q16 How old are you?

Q31 Which state do you primarily live in?

- ☐ Alabama (1)
- ☐ Alaska (2)
- ☐ Arizona (3)
- ☐ Arkansas (4)
- ☐ California (5)
- ☐ Colorado (6)
- ☐ Connecticut (7)
- ☐ Delaware (8)
- ☐ District of Columbia (9)
- ☐ Florida (10)
- ☐ Georgia (11)
- ☐ Hawaii (12)
- ☐ Idaho (13)
- ☐ Illinois (14)
- ☐ Indiana (15)
- ☐ Iowa (16)
- ☐ Kansas (17)
- ☐ Kentucky (18)
- ☐ Louisiana (19)
- ☐ Maine (20)
- ☐ Maryland (21)
- ☐ Massachusetts (22)
- ☐ Michigan (23)
- ☐ Minnesota (24)
- ☐ Mississippi (25)
- ☐ Missouri (26)
- ☐ Montana (27)
- ☐ Nebraska (28)
- ☐ Nevada (29)
- ☐ New Hampshire (30)
- ☐ New Jersey (31)
- ☐ New Mexico (35)
- ☐ New York (32)
- ☐ North Carolina (33)
- ☐ North Dakota (34)
- ☐ Ohio (36)
- ☐ Oklahoma (37)
- ☐ Oregon (38)
- ☐ Pennsylvania (39)
- ☐ Rhode Island (40)
- ☐ South Carolina (41)
- ☐ South Dakota (42)
- ☐ Tennessee (43)
- ☐ Texas (44)
- ☐ Utah (45)
- ☐ Vermont (46)
- ☐ Virginia (47)
- ☐ Washington (48)
- ☐ West Virginia (49)
- ☐ Wisconsin (50)
- ☐ Wyoming (51)

Q17 Please indicate your household's annual pre-tax income. (US \$)

- ☐ 0 - 9,999 (1)
- ☐ 10,000 - 19,999 (2)
- ☐ 20,000 - 29,999 (3)
- ☐ 30,000 - 39,999 (4)
- ☐ 40,000 - 49,999 (5)
- ☐ 50,000 - 59,999 (6)
- ☐ 60,000 - 69,999 (7)
- ☐ 70,000 - 79,999 (8)
- ☐ 80,000 - 99,999 (10)
- ☐ 100,000 or more (9)

Q43 Choosing from the list below, what is the highest level of education you have received?

- ☐ Did not graduate high school (1)
- ☐ High school graduate (2)
- ☐ Bachelor's degree (3)
- ☐ Master's degree (4)
- ☐ Doctorate degree (5)

Q43 Which race are you?

- ☐ White (1)
- ☐ Black or African American (2)
- ☐ Latino or Hispanic (7)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian or Asian American (4)
- ☐ Native Hawaiian or Pacific Islander (5)
- ☐ Other, please specify (6) _____

Q41 Please enter/paste your mturk ID in the space below.